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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

June 21st to July 20th inclusive.

The following Index gives first the class, then the name of the Inventor, and No. of the application. In this list (com.) means Invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

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Pumps, Pumping and Forcing Liquids, Pumping and Raising Water and other Liquids, Pumps, Pistons, and Packing.—W. Wood and W. Whitaker, 3117. W. F. Browne, 3154. J. and W. Brierley, 3270. H. Robinson, 3375. J. Blake, 3447.

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables.—W. Stroudley, 3066. A. M. Clark (com.), 3131. W. R. Lake (com.), 3284. A. Wilson, 3429. J. Pickering, 3438. J. Revell, 3507. A. M. Clark (com.), 3538.

Reaping and Mowing, &c.—J. T. Mitchell, 3235. E. O. Greening and E. D. Barker, 3336.

Refrigerating and Freezing, Cooling Liquids, Making Ices, &c.—H. J. Haddan (com.), 3383.

Registering, &c.—A. Schweitzer and T. Laurie, 3190. H. W. Hart, 3222. C. V. Boys, 3436. O. Ber, 3450.

Roads, Paths, &c.—T. Webb, 3170.

Ropes, &c.—H. H. Lake (com.), 3395. A. and T. H. Dix, 3459.

Ruling Paper, &c.—E. Barnett, 3241.

Screens.—J. W. Cook, 3028.

Screws, Screw Drivers, &c.—H. J. Haddan (com.), 3384.

Sewing and Embroidering.—W. R. Lake 3100. F. Wirth (com.), 3151. A. Gass, 3166. W. R. Lake (com.), 3346. J. Forbes, 3379. W. H. Beck (com.), 3381.

Shears, &c.—C. Burgon, 3018.

Ships and Boats, &c.—A. Taylor, 3016. F. Webb, 3170. H. Allen, 3203. E. L. Sheldon, 3264.

Sifting, Sorting, and Separating. &c.—S. Bruce, 2996. S. Copeland, 3084. F. Wirth (com.), 3162. C. Clay, 3209. P. Van Gelder, 3415.

Signals, &c.—D. Knight, 3167. J. Sullivan, 3360.

Syphons.—F. Sara, 3123.

Slag, or Scoria, &c.—R. Woodley, 3220.

Sluices, &c.—F. Wiswall and W. Collier, 3194.

Sounds, (Reproducing) &c.—J. Imray (com.) 3173. P. M. Justice (com.), 3433.

Spinning and Preparing for Spinning.—J. S. Gook and A. Hardwick, 2963. S. Lord and J. Kaberry, 3052. J. W. Bradley and J. Wood, 3088. C. A. Barlow (com.), 3090. P. Sharp, 3139. A. M. Clark (com.). 3163, 3183.

Stables, &c.—D. McGill, 3038.

Stays, &c.—C. Reynolds, 3001.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—E. de Pass (com.), 2977, L. Martin, 3115. J. T. Ward, 3118. J. B. Halket, 3304.

Steam Engines (Stationary, Locomotive, and Marine.)—G. Rodger, 2984. R. Duncan, 2987. A. M. Clark (com.), 3132. W. F. Browne, 3153. A. M. Clark (com.), 3184. J. H. Johnson (com.), 3274. A. M. Robertson, 3275. P. Goldschmidt, G. Hahlr and A. Heussy, 3307. J. Pinchbeck, 3427.

Steering and Guiding. &c.—J. Saunders, 3012. J. Hastie, 3174. H. Meinicke, 3378.

Stone, &c.—R. Searle, 3049. S. Hodson, 3127. E. Ransome, 3444.

Sugar and Syrups, Glucose.—W. McEachren, 3063. W. F. Browne, 3155. E. T. Hughes, 3179.

Telegraphs; Telegraph Printing Apparatus.—J. Husbands, 3008. W. Spence, 3047. G. E. Vaughan, 3142. W. R. Lake (com.), 3315. S. M. Yeates, 3335. H. E. Newton (com.), 3414. J. E. Chaster, 3458.

Thrashing Machines, Reaping Machines.—E. Foden, 2985.

Tickets, Labels, &c.—J. A. Francis, 3410.

Tilling and Cultivating, &c.—J. Howard and E. T. Bousfield, 3093.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—W. R. Lake, 3293.

Tramway Carriages, &c.—F. J. Prince, 3031.

Traps for Drains, &c.—J. Harsant, 2961. A. W. White and J. A. Evans, 3358.

Trowels.—A. Reaney, 2983.

Turning, Lathes, &c.—H. H. Lake (com.), 3057.

Upholstery, &c.—J. C. Morris, 3260.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—W. R. Lake (com.), 2948. T. Penn, 2958. J. McDougall, 2986. J. A. and J. Hopkinson, 3060. C. W. Collins, 3092. H. Conolly and A. E. Hubert, 3095. H. Conolly, 3096. A. M. Clark (com.), 3132. J. Thomas and C. J. Ennor, 3213. A. Wightman, 3280. W. Cheyne, 3287. J. W. Restler, 3372. H. A. Cutler, 3425. D. R. Ashton, 3437. J. Blake, 3447.

Velocipedes.—J. S. Edge and T. W. Ticehurst, 2947. W. M. Brown (com.), 2964. T. F, Marriott, 3014. G. Moss, 3023. W. J. Lloyd. 3121. J. Walker, 3201. W. T. Shaw and W. Sydenham, 3230. F. Beauchamp, 3326. T. Smallwood and E. W. Cooper, 3377. R. Boyle, 2973. J. G. Tongue (com.), 3185.

Water-Closets, &c.—T. S. Truss, 2939. F. Bonneface, 3034.

Weaving, Braiding, Plaiting, Preparing for Weaving, &c.—R. Illingworth, 2959. C. Catlin, 3069. J. Dodd and W. Adam, 3087. W. Alexander, 3104. E. Booth, 3259.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Reviews.

WORKED EXAMINATION.

"Questions in Plane Geometrical Drawing for the use of Candidates for the Royal Military Academy, Woolich,—the Royal Military College, Sandhurst,—the Indian Civil Engineering College, Cooper's Hill,—Indian Public Works and Telegraph Departments,—Royal Marine Light Infantry,—the Oxford and Cambridge Local Examinations, &c." —By F. Edward Hulme, F.L.S., F.S.A., Art Master Marlborough College, &c.——London: Longmans, Green, & Co.

The following prefatory remarks will convey a general idea of the scope and practical purpose of this work.

Having, from a considerable experience in teaching, found the value to ourselves of such a set of worked questions as those now published, we may not unreasonably assume that the series may prove acceptable to others, whether masters engaged in tuition or students endeavouring to qualify for any examination into which a knowledge of plane geometry enters.

But few words of preface can be needed, as the figures are in the main self-illustrative: we may, however, point out the way in which we believe the most good may be derived from our labours. The questions should be taken in the order we give them, and should then be accurately worked out without referring to our figures in any way. The student should first read the question through carefully, so as to comprehend what is really required, or he may find after he has spent a considerable time in drawing a heptagon that it was an octagon after all that was required, or the triangle that he has put within a circle should should really have been described about it. It is also a considerable help to sketch out on a piece of waste paper what is needed before proceeding to the actual working out. When the question taken has been as fairly met as the geometrical knowledge of the student will allow, the figures in our illustrations may then be turned to, and a single glance will often suffice to show whether the solution is a correct one or not. At first, no limit of time need be imposed, but as the student progresses the question of time becomes important. In an examination, the paper will ordinarily contain some seven or eight questions, and time allowed for these will be two hours, or perhaps two hours and a half; it will be well therefore to take some such proportion of work and time and see how nearly a fair examination standard is reached.

When the student is weak in any special point, say, for example, equivalent areas, the construction of scales, or the accurate placing of figures within each other, he will of course devote himself more especially to problems that bear on the particular matter in question. Such problems may readily be picked out: it was our first idea thus to classify the questions, but on more mature consideration it seemed preferable to present them in the way that the student will encounter them in any examination.

It will be noted that we have from time to time added some few comments after the questions where a few words of explanation may prove helpful, but we have not pretended to go really through all the various stages necessary in working any of the problems out, as a fair knowledge of geometry is assumed to be already possessed by anyone using our series. For this same reason we do not always show all the steps in the working, though in an examination these should always be given, the actual result required being put in with somewhat stronger lines than those that have led up to it; or all merely constructive lines may be dotted and the results marked in solid lines.

Many standard works might here be named for the guidance of the student in the preparation for examination work, but we should ourselves give the palm to Rawle's "plane geometry." This work gives every useful problem, and excludes all merely fancy things that have no practical value, and only encroach on the valuable time of anyone preparing for an examination. The book is very portable; it can therefore become a pocket companion, and the price is almost absurdly low. This handbook is very extensively used in all schools of art, as we have for years largely used it in our own classes and commended it to all our students, we may, we trust, be excused if we here, in a work intended to be of practical value and aid to all needing such assistance, refer our readers to it.

Almost all examination papers in geometrical drawing have some such heading as the following: "The construction should be neat and accurate, and should be inked in either with common or Indian ink, but candidates are recommended to defer inking until they have done all they can in pencil. The solutions must be strictly geometrical, and particular care should be taken not to efface the necessary lines of construction."

The candidate will find it a great advantage to use Indian ink, as it dries so much more rapidly than common ink, and he will thus be spared the annoyance of wasting valuable time in the inking in. It must, however, be remembered that pencil work can always be corrected if found faulty, but lines once inked in must stand.

Valuable time too may be saved by a careful perusal of the paper when it is first received, and the questions noted that are to be first attempted. A student, for example, finds that he is quite equal to questions 1, 3, 4, and 6 of his paper, and he will therefore begin with these, reserving as much time as he can afterwards spare for those that do not seem so clear to him. This is far preferable to taking the questions *seriatim*, losing much time at each difficulty, with the ultimate result that the difficulties possibly may not after all have been surmounted, while they have effectually prevented the student from doing in other questions what was fully in his power.

We need scarcely remind our readers that the problems may often be worked in more than one way. Figure 102 is an illustration of this, as we have there adopted three different methods of working it out. Diversities of construction should, however, all lead to identity of result.

Many problems, and more especially those dealing with proportionals, areas of surfaces, and scales, can be worked out arithmetically; we have not in the present case adopted this method, as it appeared desirable to keep the work as distinctly geometrical as possible, but geometrical results may often very readily be confirmed and proved by the use in addition of an arithmetical solution.

We should have been glad to have given specimen examination papers and to have worked out the problems on them consecutively, but we soon found practically that there would have been of necessity a large increase to the number of our plates of illustrations, and we were therefore obliged to select our problems with a view to filling our sheets as well as possible. As all the problems given may very advantageously be worked through by anyone going in for an examination, we have not added to each problem, as was our first idea, the source from whence it was employed, fearing that if we did so the candidate for any special examination would content himself with those that had been set by the particular examining body before whom he would have to appear.

A little ingenuity on the part of master or student will readily enable them to modify many of the questions, and so derive additional practice from their working; thus, in Fig. 7. for instance, another figure might be placed in the square, or the figure A B C D might itself be resolved into a square, and the difference of area between that and the square itself worked out, or the portions of the trapesium that are external to the square might be combined into one figure, and its area found. Many other variations will suggest themselves on a slight consideration of the question.

Problems in all these examinations are given not only to test geometrical knowledge, but also neatness of working and a knowledge of the use of instruments. We have in another of our books, "Mathematical Drawing Instruments, and how to use them," given full instructions in the use of the ruling-pen, proportional compasses, protractor, sector, and the other implements, together with chapters on the construction of scales, the diagonal scale, marquoise scale, the representative fraction, &c. : and to this we would refer our readers rather than here repeat in any way what we have elsewhere written.

We can only hope, in conclusion, that a diligent use and study of our labours will be found to have gone far towards depriving the examination paper of its terrors when the testing day arrives.

RECENT AMERICAN AND FOREIGN PATENTS.

IN *Driving piling* for railways by a driver moved forward on the piles as the work proceeds it is essential that the piles be dressed and tenoned as rapily as possible, in order that there is no delay in moving and working the driver. Mr. Andrus L. Gilbert, of Albany, N. Y., has patented an invention, the object of which is to dress the piles by machinery carried on the car of the pile-driver and driven by the same engine, so that the work can be done as fast as the piles are driven, the caps then put on, and the track for the car laid rapidly and with less than the usual expense. The same inventor has also recently invented and patented an improvement on pile-drivers used in the construction of railroads; the invention consists in the arrangement of parts for driving inclined piles. The car will carry an engine for driving the winding drum, and in operation the car is moved forward to project the platform in front, and then by transverse adjustment of the platform the leaders are brought to place to drive the straight piles in succession. The leaders are then set at the required inclination, and the table turned first to one side and then to the other to drive the inclined piles in line with the straight piles. The work of driving is thus completed as the machine is advanced.

Mr. Christopher C. Bomberger, of Crocker Station, Mo., has patented an improved *windmill*, in which the wheel revolves in a horizontal plane, and is provided with wings which are kept in a vertical position during half of the revolution, and in a horizontal position during the other half of the revolution by an ingeniously arranged mechanism. The wheel exposes a great vane surface to the wind, and is regulated automatically.

Mr. Thomas Keith, of New York city, has patented an improvement in *endless-chain elevators* for elevating or lowering freight on docks and vessels. The object of the invention is to provide for transfer of freight from a vessel to a dock, or the reverse, by arrangements that are practically automatic in their actions. The invention consists in a jointed frame apparatus that can be set to both elevate and convey the freight, so that no handling is required between the vessel and dock.

A car-coupling, patented by Mr. Jefferson E. Barrett, of Mount Vernon, Iowa, consists in a draw-head having a U-shaped groove in its upper surface, combined with a flat bar sliding in a vertical longitudinal slot in the draw-head, and provided with two lugs. The bar having levers pivoted thereto for raising and lowering it, the free ends of these levers pass through slots in plates provided with locking devices. When the vertically sliding bar is in the lowered position it holds the link in the groove in the draw-head, and it raises the link out of the groove in the draw-head when it is raised by means of the levers or the handle at its upper end.

Lubricators, patented by Mr. Henry R. A. Boys, of Barrie, Ontario, Canada, relate generally to the class of lubricators for engine cylinders operated by condensing steam, a drop of water displacing a similar quantity of oil, which enters the steam-pipe and passes thence to the cylinder. The great advantage secured by the use of this form of lubricator is that the lubrication is carried on continuously, effecting a more perfect lubrication than can be secured in the ordinary lubricator, besides saving a large percentage of the oil.

Rotary steam engines, patented by Messrs. George W. Wade and Joshua M. Wardell, of Cadillac, Mich. The object of this invention is to construct a cheap and durable engine and to economise steam in the application of power. The casing of the engine is ellipsoidal, and the rotating piston, which is set centrally in the casing, is provided with radial wings capable of sliding in and out of the piston, to follow the inner surface of the cylinder.

Mr. Leonard Anderson, of Painesville, O., has patented an improvement in *locomotive valve-gear*, which consists of a vertically fixed lever, pivoted on the main pin, knuckle-pin, or other point on the parallel rods, having pivoted to its head on horizontal horns or pins two forward extending rods, one of which connects by a pin with a perpendicular rocker-arm, to whose lower end is pivoted the valve-rod, while the other forward extending rod connects with a fixed slotted arc that hangs nearly parallel with the rocker-arm, a pin in the end of the rod sliding in the slot of the arc. This pin serves as the fulcrum on which the gear operates, and is adjustable by means of lever and suitable connections in the slot of the arc, whereby the cut-off may be varied and the steam reversed. Motion is transmitted to the gear by a quadrant-lever, fixed on the parallel rods.

A novel folding bed has been patented by Mr. Charles M. Morrison, of New York city. This invention relates to that class of folding beds which are hinged in the middle, the parts folding toward each other and having the appearance of a desk or *chiffonnier* when folded. The object of the invention is to balance the bedstead without the use of counter-weights, and to permit of making the legs of less height than one-half of the length of the hinged section forming the bedstead.

M. Alfred Michaud, of Paris, France, has patented an improved permanent *galvanic vat*. By this improvement the expense necessary for setting up the apparatus and maintaining it in working order is greatly reduced, the purity of the galvanic liquids is maintained, the galvanic action is regular and uninterrupted and its energy is increased, the manipulation is simplified, and, it is claimed, an economy of at least fifty per cent. of the salts ordinarily employed is effected. The principal feature of the invention consists in a feeding device for supplying new fluids continuously, and in a siphon arrangement for removing the spent liquid.

An improved *straw-conveyor belt* has been patented by Mr. Alton J. Park, jun., of Virginia, Mo. The object of this invention is to prevent the straw from catching in between the ends of the slats and the conveyor belt, and to secure the ends of the slats more effectually to the belt.

An improvement in boxes, patented by Mr. Charles Beiser, of Toledo, O., consists in a box provided with a two-part or divided slip lid, and in elastic connections of the divided lid with the body of the box, and of the lid sections with each other, whereby the lid sections are attached to the body and are automatically opened when the elastic connection uniting them is released.

Mr. Edward E. Shermerhorn, of New York city, has patended a new and improved *milling attachment* for vises. The object of this invention is to furnish a handy, efficient, and labour-saving tool for the shop, for doing the work by hand that is usually done with files. It consists in a milling tool carried by adjustable devices, by which it may be attached to a vise or directly to the work.

Mr. John Brush, of Albany, Oregon, has patented an improved *grain separator* for separating oats from wheat or other grain and for removing chaff from wheat or other grain. In this machine all of the sieves are easily inserted and removed, and the machine is readily adjusted for different kinds of work. It runs lightly, and is easily and cheaply constructed.

Horsehair machinery for untwisting and carding curled horse-hair has been patented by Mr. Thomas Adcock, of Adelaide, South Australia. The object of this invention is to untwist ropes of horse hair and to card the hair by a continuous operation in one machine. This machine will perform the work much more rapidly and better than it can be done by hand. One, two, or more untwisters may be used as desired, and the machine driven by hand or other power.

A novel motor has been patented by Mr. Samuel N. Silver, of Auburn, Me. The invention consists of one or more sliding and reciprocating cylinders, containing pistons held in these cylinders by latches, which pistons are each adapted to slide on a central rod surrounded by a coil spring, to which pistons rocking arms are pivoted, which are loosely mounted on a shaft, these arms being provided with pawls or other suitable clutching devices for rotating the shaft. When the cylinders are pressed downward the springs are brought in tension, and when the springs exert the power stored in them they rotate the shaft.

Rolling mills, patented by Mr. Wilhelm Wenstrom, of Orebro, Sweden, relate to that class of rolling mills in which one pair of horizontal and one pair of vertical rolls are arranged to roll metal simultaneously upon four sides, and are made adjustable with relation to each other. The object of this invention is to give the rolls an exact and steady motion under all circumstances, and to secure a compactness of construction and arrangement by which the bearings are adapted to withstand the required pressure without straining or displacement.

Mr. George A. White, of Halifax, Nova Scotia, has patented an improvement in *circular knitting machines* for the manufacture of tubular fabrics, particularly the class of hand machines using double sets of needles for forming ribbed fabrics. The object of this invention is to render such machines more perfect in operation, and thus produce better fabrics with less labour and attention in the operation of the machine. The novel features consist particularly in the fender or latch opener and the cams for moving the needles.

A pencil-sharpener has been patented by Mr. Franz F. Kullrich, of Berlin, Germany. The invention consists of two convex plates with roughened surfaces, and having a strip of felt or other fibrous or hairy material attached to their inner ends, which plates are hinged to each other or connected by a spring, so that they can be separated to admit the point of the pencil, and can be pressed together, as the diameter of the pencil point is decreased, by rotating or twirling the point between the roughened plates.

FLAMELESS COMBUSTION.

At the recent soirée of the Society of Chemical Industry at Owens College, a new theory of combustion was illustrated by Mr. Thomas Fletcher, of Warrington, the results being so totally unexpected that many present would, and in fact did, go away with the impression that some deception was being practised. Mr. Jacob Reese, the inventor of the Reese fusing disc, has stated his belief that if it were possible to produce combustion without flame, the temperatures and duty obtained from any fuel would be enormously increased. It has remained for Mr. Fletcher to not only prove the possibility of flameless combustion in more than one form, but also to demonstrate practically the enormous high temperatures which can be obtained by this means. Taking a ball of iron wire about three pounds in weight, Mr. Fletcher placed it on a slab of fire clay, and directing a blowpipe flame on it for a few seconds he suddenly blew the flame out. The temperature increased so rapidly that in a few seconds the wrought iron fused and ran into drops, and this temperature was steadily maintained. The room was darkened, but the closest examination did not show a trace of flame, although the fact that the gas was burning was proved by repeatedly relighting and extinguishing it. The same experiment was repeated in another form by directing the flameless heat into a small fire clay chamber, in which a refractory clay crucible, made specially for nickel melting, was partially fused and worked into a ball like soft putty, the sides of the fire clay chamber being at the same time fused. The heat was so great that the blow-pipe laboratory which was given up to Mr. Fletcher for the evening was much too hot to be agreeable, in spite of open windows and ventilators. How far this discovery can be utilised remains to be seen, but it would appear that the presence of flame, usually considered to be a sign of combustion, is really an indication of imperfect results, and the best duty is to be obtained only when flame is totally absent. It is certain that such temperatures as obtained by Mr. Fletcher without flame have never previously been obtained with the fuel used, which was nothing more than a small gas supply for a quarter inch pipe, assisted by an air blast.

THE FIRE RISKS OF ELECTRIC LIGHTING.

On this subject Mr. Thomas Bolas writes in the *Journal of the Society of Arts* as follows:—A set of rules bearing on the matter has recently been issued under the auspices of the Society of Telegraphic Engineers, and it appears to me to be necessary to call attention to a few points.

The first impression created on reading them (the rules in question) is that they have been compiled with undue haste, and without proper and deliberate consideration, it being, moreover, evident that their want of clearness and definitive meaning is partly due to careless revision as regards literary composition, and partly to an indefinitiveness with respect to the ideas themselves.

We find that the telegraphists say that the insulation of the coils and conductors of the dynamo should be perfect; a condition of things altogether impossible in the present condition of electrical science. Indeed, one would have expected the demand for perfect insulation to come rather from one of the modern school of *soi-disant* electrical engineers, or other tyro in electric science, than from the collective wisdom of the telegraphists. Another illustration of the loose, inconsequent manner in which these rules are put together, and of the vagueness of the language used, is afforded by the requisition that the dynamo "should be kept perfectly clean." Cleanliness, like insulation, is only relative in respect to such a matter as this, the ideal of perfect cleanliness being unattainable, even by the chemist, when working with simple and easily disponable objects. In actual practice, we universally find that when a course so theoretically perfect as to be impossible is ordered or enjoined, that both law and lawgiver soon become to be despised.

It will be found that the telegraphists are remarkably vague with respect to the important subject of coverings for conducting wires, their instructions being merely to the effect that the conductors "should be sufficiently insulated," or "should be protected by suitable additional covering," no particulars whatever being given as to how wires should be regarded when damp is likely to have access, or when passing through walls or partitions. Notwithstanding this notable omission, we find special caution as to the need of fixing the dynamo in a dry place, and where it will not be exposed to a rain of flying particles or dust; points so obvious as to suggest themselves to anyone possessing even a small proportion—say ten per cent.—of the average intelligence.

As might be expected, from the careless way in which the whole code is drawn up, we find several contradictory paragraphs. We are told in one place, that if wires become perceptibly warm, it is a proof that they are too small for the work, and that they ought to be replaced by larger wires, while a previous statement is to the effect that above 150° is the temperature to be avoided.

The fire-risk rules issued by the telegraphists form the sixth tolerably comprehensive code hitherto published, and they are certainly much less clear and pertinent than any one of the preceding codes; this being true, not only as regards subject matter, but also as regards language. These failures appear, however, to arise principally from undue haste in the production of the rules.

When my paper on the subject of the "Fire Risks of Electric Lighting" was communicated to the Society of Arts," I regarded Mr. Heaphy's set of rules as being the best; and I supplemented them by nine suggestions, it being intended that these should be considered in formulating a more comprehensive code. It is curious to note that the telegraphists have embodied several of my suggestions in their rules, but only after having well turned them round about, so as to give them some appearance of originality. My suggestion, that no part of the conducting wires should be allowed to come within one-fourth of an inch of any metallic body, excepting when such metallic body forms some essential part of the electrical apparatus, finds a clumsy and partial expression in rule 19 of the telegraphists, where we find it ordained that "the lanterns and all parts which are to be handled should be insulated from the circuit;" while my requirement, that no conducting wire is to be allowed to come within half an inch of any metallic body having direct electrical connection with the earth, finds an equally partial and incomplete exposition in the telegraphists' suggestion, that the dynamo should be fixed on an insulating bed.

One point on which I most strongly insisted is the importance of not only soldering the joints of the electric conductors, but also of properly binding them. This matter is evidently regarded by the telegraphists as being of considerable importance, as they give a diagram illustrative of a method of making a joint according to these principles; but the joint illustrated is unstructural and defective to a high degree. The strain comes on opposite sides of the binding spiral so as to tend to rack the spires into an oblique position with regard to the main wires, and so tend to break the soldered joint. If, however, the ends of the main wire are turned over a little more sharply than represented in the telegraphists' diagram, and in making the joint, the turned over ends are made to correspond as nearly as possible with the same longitudinal line, compression of the spiral takes the place of racking strain. To place the purlins and pole-plates of a roof over the rafters would be quite a comparable proceeding to making a lead joint as suggested by the telegraphists. (The mode of making a joint which is here deprecated for electric light leads, is very fairly well suited for ordinary telegraph work, solder not being essential, and there being, therefore, no objection to a racking of the spires of binding wire.)

The best way to make an electrical joint is, first to thoroughly tin the wires, and then wipe them carefully while they are still hot; any chloride of zinc which may have been used being next removed by a damp cloth. The wires are then bound, and subsequently well grouted with solder; resin only being used as a flux.

One valuable suggestion, which does not appear to have been embodied in any other code, may be found in the rules of the telegraphists, as we find them strongly insisting that "the chief element of safety is the employment of skilled and experienced electricians to supervise the work."

The need of a thoroughly comprehensive and clear set of rules is now more patent than ever, and this can only be arrived at by a conference, which should comprise not only men who have received a systematic scientific training, but also practical electricians, expert technologists, and specialists as regards insurance risks.

Palestine Exploration Fund.—Captain Conder and Lieutenant Mantell have returned from Palestine, bringing with them the first two sheets of the New Survey of Eastern Palestine, which cover about 500 square miles on the north and east of the Dead Sea, extending beyond Ammon. These sheets are beautifully done, and the contour of the surface are most carefully represented by the hill-shading. Lieutenant Mantell, who had charge of the photographic department, has brought a collection of photographs of the remains of the old cities, and of the "rude stone monuments," of which such numbers were found. Captain Conder had the honour, along with Mr. Moore, the Consul at Jerusalem, of accompanying the young Royal Princes during their recent tour in the Holy Land. One of the places which the party visited was Hebron, and they were allowed to enter the mosque over the Cave of Machpelah, concerning which Captain Conder was able to carry off some important points of detail. They could look down the cave, and were able to see a door leading from one apartment into another. This hole, which communicates from the mosque through the floor to the cave, from its size seems to resemble the hole through the Sakhra to the cave beneath it at Jerusalem. This is a very valuable bit of information, as the purpose of the hole in the Sakhra has never been properly explained, and the Hebron example may, perhaps, throw light on the subject. Captain Conder has undertaken to write a report of the visit of the Princes for the Prince of Wales, and its publication will give us all the details. Captain Conder also accompanied the Princes up the Jordan as far as Banias, where he has discovered another important group of rude stone monuments, showing what a rich field the eastern side of the Jordan valley is for this class of remains. The plan followed in the Survey of Western Palestine of collecting all the names of places has been continued in the new Survey. The first person met on entering a village is asked the name of it; others, including the head-man, are asked the same question, and the answers are written down in English, and in Arabic by a native scribe, who hears what has been said. If a place chances to have more than one name they are likely to be caught by this process.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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SESSION 1881—1882.

If any meeting be held special notice *per post* will be supplied.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

There is nothing to notify as to Patent Law in Parliament or other matters, except that the Patents for Inventions Bill has been withdrawn.

Monthly Notices.

King's College, Windsor, N.S.—At the recent Encænia of this our oldest Colonial university, and, by the way, the only one out of Great Britain with a Church of England theological faculty—the degree of D.C.L. was conferred on Mr. Edward David Hearn, M.A., who has long been connected with the London scientific press. His graduating thesis treated at considerable length of the Non-Professional Study of the Roman Civil Law, the leading argument being that everyone intrusted with the power to legislate or to vote should possess a knowledge of the sound principles of law, which he briefly recapitulated. The papers on his "Extension of Horner's Method for the Synthetic Division of Algebraic Quantities," "On Synthetic Division in Arithmetic," "On Mental Logarithms," &c., which Mr. Hearn has at different times contributed to the Scientific Review will be within the recollection of many readers, and he will have the congratulations of numerous friends upon the honour now obtained.

Death of Mr. Robert Wilson, C.E.—Mr. Robert Wilson, C.E., F.R.S.E., who died at Matlock on the 28th ult., in his 79th year, was the late managing partner of the firm of Nasmyth, Wilson, and Co., of Patricroft, Manchester. He was born at Dunbar in 1803, and received but meague education in his early years, but succeeded in reaching the highest eminence of the engineering profession. He had a large share in the perfecting of the steam hammer, under Mr. Nasmyth, and seems to have been the first to discover the principle of screw propulsion. In 1833 he submitted his models to the Admiralty, and then they reported against the utility of the principle. One of his latest honours was an award of £500 by the late Administration for "improvements of the fish torpedo." Mr. Wilson was one of the earliest members of the Inventors' Institute.

Extension of Yorkshire Coalfields.—Professor Green, of the Yorkshire College, in his scientific evidence before the House of Commons on the Hull and Barnsley Extension Railway, named Carlton as a point at which coal might be expected to occur; good coal has been discovered at this place. At Snaith, near Goole, a deep boring passing through the Permian and Trias has reached true coal-measure shale, and the discovery of the extension of the Yorkshire coalfield beyond the limits assigned by the Coal Commission is anxiously expected.

Captain Magnaghi's Floating Compass, which is in use in the Italian navy, has been subjected to some very severe tests on board the *Duilio*. The needle, enclosed in a hermetically sealed ellipsoidal case, which is delicately suspended upon a conical brass pivot, floats in water to which has been added one-tenth its volume of alcohol. The compasses were not in the least disturbed by the discharge of the 100-ton gun on board the *Duilio*.

Mr. Henry Vizetelly has written a quarto volume on the "History of Champagne" (Sotheran and Co.), in which he has collected a large number of facts, many of them very curious and interesting. Mr. Vizetelly has traced the gradual growth in popularity of sparkling champagne since the days of Perignon, and he has not neglected the earlier history of the champagne vineyards. In the second part of the book Mr. Vizetelly has added particulars regarding the cultivation of the vines, and the chief firms at Rheims, Epernay, &c. A large number of woodcuts are given, some excellent, but some might well have been omitted.

The Yorkshire College at Leeds is to be completed at once. It will be remembered that the only part of the permanent building erected is that which is devoted to textile manufactures and dyeing. The contracts for the other divisions have now been let, and the works will be commenced forthwith.

Distillation of Coal-tar.—Professor Lunge has followed up his "Theoretical and Practical Treatise on the Manufacture of Sulphuric Acid and Alkali" by the preparation of a scarcely less important work—although of lesser bulk—on the Distillation of Coal-tar and Ammoniacal Liquor. It will be published, as his previous book was, by Mr. Van Voorst.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

AUGUST, 1882.

ELECTRICITY AND NAVIGATION.

The use and application of electric power is so various, and the promise it holds out for future practical advantage so considerable, that the suggestion of navigation as within its range of effective operations ought not to astonish us. However, it is a matter so noticeable as to be worthy of a principal position in our columns.

Since electric lamps have ceased to be laboratory apparatus, able to operate only during experiments of short duration, to become systems of continuous lighting, there has arisen the serious question of applying them on board of vessels of all kinds.

M. Th. du Moncel in his *Exposé des Applications de l'Electricité*, pointed out, several years ago, the immense advantages that the navy as well as the merchant service might derive from the use of the new light for illuminating the way, avoiding collisions, traversing ports in order to land at night, and finally for manœuvring as surely in darkness as in broad daylight. We see in this same work, remarks C. C. Soulages in the *Scientific American*, that the first experiments were made with the Alliance magneto-electric machines, about the year 1855, on board the *Jerome Napoleon*, and then repeated on the *Saint Laurent*, the *Parfait*, the *D'Estrées*, the *Heroine*, the *Coligny*, and the *France*; but, at that epoch, electric beacons had not been devised, the luminous focus being simply installed at the mizen mast. It was on the *Amerique* that the first complete trial was made, the lantern having been placed at the top of a turret at a height of about five metres above the deck. The lantern, properly so called, was composed of prismatic glasses, and could illuminate an angle of 225°, leaving the vessel entirely in the shade. The regulator, which was on the Serrin system, was suspended *à la Cardan*. Such an arrangement certainly constituted a serious progress; but still it presented a certain number of difficulties in regard to manœuvring, and so the officers of the *Amerique*, whom we have often met in New York, have stated to us that the electric light was rarely used on board. But the question has been much studied for some little time past. and we may cite, in passing, the ingenious arrangement devised by Mr. Serrin for sending the luminous rays from an electric focus in all directions. Visitors to the International Exhibition of Electricity will certainly remember this hand-manœuvred regulator, which was shown in the grand nave in front of the principal entrance. The combination adopted to this apparatus would render excellent services on a ship.

Now, the question of electric lighting is entirely the order of the day in the marine, and the press has duly recorded the trials and the definite applications which are being made all the time on numerous ships, both with regard to internal lighting (for which incandescent lamps are employed) and to safety beacons, which should necessarily be constituted of foci of a certain intensity.

The period that we are now passing through renders this study of the utmost interest. It is well known, in fact, that every year, toward the vernal equinox, the temperature, upon becoming milder, brings about a breaking up of the polar ices, and the immense fields of the latter, situated in the Arctic regions, after doubling Cape Farewell at the southern extremely of Greenland, are borne along at the moment of breaking up, by a great current, which, occupying the whole width of Davis Strait, descends across the Atlantic and carries with it fields and mountains of ice over the route taken by vessels going from European to United States ports. It is at once a solemn and a sublime spectacle to see the violently agitated ocean roll its waves like mountains against these unyielding bodies; but, when it strikes with violence these masses that it has put in motion, the effect is wonderful, and the results of the collision have a terrific grandeur. At times it bears down upon and buries many feet beneath its waves the blocks of ice, which, rising again to the surface, shed the water from them in foaming cataracts; while each individual mass, rolling in its bed, strikes against its neighbour and wrestles with it till one is superposed on the other. And it is not within a circumscribed space that such phenomena occur, but they are often observed going on as far as the eye can reach, and over an extent of surface many miles square. Unlucky then is the vessel which should get entangled in this immense moving chaos, and woe to her if, during her progress at night, she be not provided with the apparatus necessary for avoiding these terrible icebergs, whose shock would be certainly fatal.

A ship may thus direct herself alongside of mountains of ice, and avoid collision therewith by the aid of a properly arranged electric light.

We have said that these questions possess all the interest of actuality. We read, in fact, in one of the last numbers of *Nature*, that the steamers that have recently arrived at New York, met, on their way, in 45° 48′ North latitude and 47° 48 East longitude, immense fields of ice; and that the *Circassian*, it appears, was obliged to bear toward the south for two days in order to avoid them; and that the *Saint Germain*, which lately left Havre, had the start of them only seventy hours.

Proceedings of Societies.

ROYAL SOCIETY.

June 8.—The President in the Chair.—Annual Meeting, for the election of Fellows.—The following were elected: Prof. V. Ball, Dr. G. S. Brady, Dr. C. Buchanan, C. B. Clarke, F. Darwin, Prof. W. Dittmar, Dr. W. H. Gaskell, R. T. Glazebrook, F. D. Godman, Prof. J. Hutchinson, Prof. A. Liversidge, Prof. J. C. Malet, W. D. Niven, R. H. I. Palgrave, and W. Weldon.

June 15.—The President in the chair.—Announcement was made that a commemoration in honour of the late Charles Darwin, attended by professors and students, had been held in the great hall of the Istituto di Studi Superiori at Florence.—The following papers were read: "Researches on Spectrum Photography in relation to New Methods of Quantitative Chemical Analysis," and "On the Reversal of Metallic Lines as seen in Over-exposed Photographs," by Prof. W. N. Hartley.—Experiments on the Value of the Ohm," by Messrs. R. T. Glazebrook, J. M. Dodds, and G. B. Sargent,—"On a Deep-sea Electrical Thermometer," by Mr. C. W. Siemens,—"On the Coxal Glands of Scorpio, hitherto undescribed, and corresponding to the Brick-red Glands of Limulus," by Prof. E. Ray-Lankester,—"On the Specific Heat and Heat of Transformation of the Iodides of Silver," by Profs. Bellati and Romanese (Padua),—"On a Tangential Property of the Regular Hypocycloids and Epicycloids," and "On Theorems relating to the Regular Polyhedros which are analogous to those of Dr. Matthew Stewart on the Regular Polygons," by Mr. H. M. Jeffery,—"On the Critical Point of Mixed Gases," by Mr. G. Ansdell.—"On an Arrangement of the Electric Arc for the Study of the Radiation of Vapours, together with Preliminary Results," "On the Ultra-violet Spectra of the Elements: Part I., Iron," and "General Observations on the Spectra of Carbon and its Compounds," by Profs. Liveing and Dewar,—"Further Observations upon Liquid Jets," by Lord Rayleigh,—"On a Collection of Rock-Specimens from the Island of Socotra," by Prof. Bonney,—"The Life History of the Ringworm Fungus (*Tricophyton tonsurans*)," by Messrs. M. Morris and G. C. Henderson,—"On an Instrument for correcting Gaseous Volume," by Mr. A. Vernon Harcourt,—"On the Action of certain Reagents on Coloured Blood Corpuscles: Part I., Blood Corpuscles of the Frog and Newt," by Prof. Stirling and Mr. A. Rannie,—"On the Nerves of the Epiglottis," by Prof. Stirling and Mr. G. Duffus,—"Sunspots and Terrestrial Phenomena: I., On the Variations of the Daily Range of Atmospheric Temperature; II., On the Variations of the Daily Range of the Magnetic Declination as recorded at the Colaba Observatory, Bombay," by Mr. C. Chambers,—"On a Method of tracing Periodicities in a Series of Observations when the Periods are Unknown," by Narayeu Nene Vinayek (Bombay),—"On the Development of the Enamel of the Teeth of Vertebrates," by Emily Nunn,—"On the Photographic Spectrum of Comet (Wells) I., 1882," by Mr. W. Huggins,—and "On the Relation to Heat of the Contagio of the Two Forms of Septicamia known respectively as Pasteur's and Davaine's," by Mr. G. Dowdeswell.—The Society adjourned over the Long Vacation to Thursday, November 16th.

GEOGRAPHICAL SOCIETY.

June 12.—Right Hon. Lord Aberdare, President, in the chair. The following gentlemen were elected Fellows: Major-General F. C. Trevor, Major W. J. Williamson, Messrs. E. H. Day, J. Hingston, J. Martin, S. B. Power, H. Cooper Rose, jun., G. B. Starkweather, and J. W. Wells.—The paper read was "Explorations in South Central Madagascar," by the Rev. W. D. Cowan.

NEW SHAKSPERE.

June 9.—Mr. F. J. Furnivall in the chair.—Dr. B. Nicholson read a paper, "Was Hamlet Mad?" answering the question in the affirmative. Treating the question from a strictly medical point of view, and quoting casses in point, Dr. Nicholson said that Shakspere would choose to represent madness of a paroxysmal nature, as was common in the writings of his contemporaries. We first notice that it was his mother's impurity, not his father's death, that preyed upon his mind; that he was suffering from disappointed ambition; and that he had bad dreams, and a dislike for the harmless Polonius that was unaccountable. These were the "predisposing causes," the "exciting cause" being his father's ghost. The great proof of madness was his want of perception of moral responsibility, as shown in his conduct after killing Polonius. His want of resolution was another striking point; and the idea, so common in madness, that his best friends were his enemies, as in Ophelia's case. Hamlet not only says himself that he was mad, but reiterates it.—Mr. Furnivall held that if Hamlet was mad then the interest in the play almost ceased,

SOCIETY OF ANTIQUARIES

June 8.—Mr. J. Evans, V.P., in the chair.—Mr. A. W. Franks exhibited and presented a collection of architectural and topographical drawings by Samuel Lysons, the author of "Reliquiæ Brit. Rom."—This being an evening appointed for the ballot, no papers were read. The following candidates were elected: Mr. A. Hartshorne and the Rev. J. F. Wickenden.

ASIATIC SOCIETY.

June 19.—Sir Bartle Frere, President, in the chair.—Lord Wentworth, Sir H. Peek, Sir W. Andrew, General G. Ramsay, Messrs. C. Peek and W. Mackinnon were elected Resident Members; and Messrs. F. Holmwood and M. A. Pandia, Non-Resident Members.—A paper was read by Mr. Holt "On the Importance of the Study of Chinese Literature," with special reference to the Chinese library of the Society, which contain most of the works alluded to. In this paper he confined himself to those classes most likely to interest Western scholars, drawing particular attention to dynastic histories, encyclopædias, and art literature (superbly illustrated books on bronze vases, &c.). Other very ancient MSS., he added, were devoted to inscribe stone tablets. Mr. Holt then showed there was evidence of a very early communication from some ports on the Chinese coast to near Martaban, or along the valley of the Irawaddy to the north-west capital of China, then at Se-ngan-Foo or Honan-Foo. The name of China he held to have been derived from the Indians, who first knew that country, and that it was not due to the Tsin dynasty, but came from the name of the compass, specimens of which were supplied to the early envoys, the Chinese being thus known in India as the "compass people," (just as the Seres derived their Western name from "silk." That the knowledge of this fact was lost to both Indians and Chinese is clear from the use by Hiouen-Tsang and later writers of two symbols (see Morrison's "Dict.," Syllabic Part, No. 8033) to designate the country, as these, while giving the sound "Che-ha," indicate that they are substitutes for original words of like sounds, the true sense of which cannot now be recovered. Having shown that M. Reinaud's view of an intercourse between China and Egypt in the first century A.D. has no real foundation, Mr. Holt further stated that there was no evidence of an embassy from M. Aurelius having gone by sea to China in A.D. 166. In conclusion, he urged that in his judgment there was no proof whatever of any knowledge of a maritime way to China before the fourth century A.D., the voyage even of Fahian at that period being open to serious criticism. He believed, therefore, with M. Gosselin, that the Cattigara of Ptolemy was probably not far from the present Martaban, and that India for a considerable period up to the seventh century A.D. dominated over Cambodia.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

June 7.—The Rev. S. M. Mayhew in the chair.—It was announced that the Duke of Somerset had been elected President of the Association for the ensuing year, and that the annual congress would commence at Plymouth on the 21st of August. Visits will be paid to Totness, Dartmouth, Berry Pomeroy, Tavistock, and other places of interest in the locality.—Mr. J. Gunn called attention to the mutilation, many years ago, of some of the piers supporting the central tower and spire of Norwich Cathedral, and made suggestions for their being strengthened.—Mr. E. Way exhibited a number of Roman articles found in Southwark.—Mr. C. D. Sherborn produced a representative collection of flint and stone implements from America and European countries.—Mr. C. H. Compton described a fine collection of fictile objects, some from Athens, and many recently discovered in London, among which was a standing lamp of leather, formed evidently by compression in a mould.—Mr. L. Brock exhibited a series of Venetian beads found in Aldgate.—The Chairman described a large number of beautiful objects he produced, among which a jewelled cross and a silver cover to a Roman thurible were of great interest.—The first paper, "On Cuddy's Cove, Northumberland," by Dr. A. C. Fryer, treated of a little-known natural cavern, the traditional place of abode of St. Cuthbert. Various references to Bede's "History" appeared to point to the locality and to give ground to the tradition.—The second paper was by Dr. J. Stevens, "On Urn Burials at Basingstoke." During some recent building works two grave-like excavations in the chalk have been found in which were various food vessels and other vases of late British date. All appearance of interments apart from these had disappeared.—The third paper was by Mr. W. Myers, "On a Roman Villa at Binizza, near Corfu." A fine building has been discovered, the plan of which was exhibited, and the arrangements, here in very perfect state, throw light on similar buildings found in England in a more delapidated condition.—The proceedings were brought to a close by remarks from the Chairman on the success of the session now concluded.

PHYSICAL SOCIETY.

June 10.—Prof. Clifton in the chair.—Major-General Martin was elected a Member.—Mr. W. F. Stanley read a paper "On Sonorous Vibrations," illustrated by experiments on tuning-forks.—Mr. W. Bailey exhibited a working model of an integrating aneometer.—The Society meets at Oxford on June 17th, and South Kensington on June 24th.

June 17.—Prof. Clifton, President, in the chair.—The meeting was held at the Clarendon Laboratory, Oxford.—Dr. W. H. Stone exhibited a new dynamometer for measuring the currents used in medical electricity, and fitted with a movable coil of aluminium wire.—Mr. Bosanquet read a paper "On the Use of Secondary Batteries for working Electro-magnetic Appliances is Observing." The batteries are charged by a dynamo and used in place of Grove cells.—Prof. Clifton described some devices of his for lecture purposes, including a way of bringing the light spot quickly to rest in electrometer experiments, and a lecture galvanometer which is readily dismantled and explained to a class.

HISTORICAL SOCIETY.

JUNE 15.—Mr. J. Heywood in the chair.—The following papers were read: "Periods of Intellectual Activity," by Prof. Guthrie, —and "Ancient Britain," by Rev. G. Edwards.—Discussions followed, in which Alderman Hurst, Dr. Zerffi, and Messrs. Park Harrison and T. Pagliardini took part.—Votes of condolence were passed for the deaths of Col. Chester and of Dr. Pauli.

ROYAL SOCIETY OF LITERATURE.

JUNE 28.—Mr. J. Haynes in the chair.—Mr. A. Marks read a paper "On the St. Anne of Leonardo da Vinci." Taking as his text the well-known account given by Vasari of the cartoon of St. Anne, executed by Leonardo for the Servites of Florence, Mr. Marks showed that the description confused two designs, that of the cartoon now in possession of the Royal Academy, and another composition represented by the picture in the Louvre. The differences between the two designs were pointed out, and Mr. Marks then endeavoured to answer the questions, Was the Royal Academy's cartoon the great work so celebrated by early writers? and, What was the relationship between the two designs? The conclusion arrived at was that the Royal Academy's cartoon represented an early stage in the development of an idea finally carried out in a work resembling the Louvre picture. That this cartoon was a similar composition to the Louvre picture seems to be proved by the fact that whereas but one copy was known of the Royal Academy's cartoon, Mr. Marks was able to enumerate nineteen copies or adaptations of the whole or part of the Louvre design. Photographs of some of these works were exhibited. Mr. Marks contended that Leonardo's cartoon could not possibly have been executed under the circumstances mentioned by Vasari, and showed grounds for believing that the work was produced at Milan before the fall of Lodovico Sforza. Proof was given of the existence at Milan in 1618 of a cartoon of the Louvre design, probably a genuine work of Leonardo. In 1631, a cartoon ascribed to Leonardo was in the collection at Turin of Charles Emanuel I. Another cartoon, probably a copy by Marco da Oggione of Leonardo's original, was about 1695 in the possession of Padre Resta. Mr. Marks then traced the history of the Royal Academy's cartoon, showing that it was probably that mentioned by Lomazzo as Aurelio Luini's. It afterwards passed into the hands of the families of Arcouati and Casnedi, both of Milan (remaining with the former about a century), and of Sagredo of Venice. It left Italy about 1760 and is first noticed at the Royal Academy in 1791. How it got there is not known. In conclusion Mr. Marks urged that inquiry should be made about a cartoon mentioned by Dr. Waagen as being, in 1839, in the possession of the Plattemberg family of Westphalia, but a few years ago in the collection of Count N. Esterhazy at Vienna. This cartoon is stated to be Leonardo's work.

ENTOMOLOGICAL SOCIETY.

JUNE 7.—Mr. H. T. Stainton, President, in the chair.—Mr. P. B. Mason exhibited dark varieties of *Zygæna filipendulæ* and *Callimorpha dominula*, as well as of the insect formerly supposed to be *Agrotis Helvetina*, Boisd., but which was now believed to be a remarkable variety of (*Nematus Ribesii*). Mr. McLachlan read a revised list of British Trichoptera.—Mr. W. L. Distant read "Descriptions of new Species and a new Genus of Cicadidæ from Madagascar."—Mr. A. G. Butler communicated "Descriptions of Heterocerous Lepidoptera collected in Chilli by Mr. T. Edmonds: Geometrites."

CHEMICAL SOCIETY.

JUNE 15.—Dr. Gilbert, President, in the chair.—The following papers were read: "Note on beta Naphthaquinone," by Mr. C. E. Groves.—"On some New Compounds of Brazilein and Hematein," by Messrs. J. F. Hummel and A. G. Perkin. Extract of logwood is dissolved in hot water, and when cool ammonia is added in slight excess. This solution by exposure to the air deposits a dark purplish precipitate of hematein, which on purification gave numbers indicating the formula $C_{16}H_{12}O_6$. By the action of cold sulphuric acid an orange crystalline substance $C_{16}H_{12}O_6SO_3$ was obtained; by the action of hydrochloric acid in sealed tubes hydroxyl is replaced by Cl ($C_{16}H_{11}O_5Cl$); a similar body is produced by hydrobromic acid. Brazilein was prepared in a similar way from brazil extract. It forms compounds which resemble those of hematein.—"On the Determination of Nitric Acid as Nitric Oxide by means of its Reaction with Ferrous Salts," Part II., by Mr. R. Warington. The method is founned on that proposed by Schloessing, but the nitric axide is collected and determined by gas analysis, the gas being absorbed by caustic potash after successive treatments with oxygen and pyrogallol; great care was also taken to exclude all oxygen from the carbonic acid used.—"On a New Process of Bleaching," by Messrs. J. J. Dobbie and J. Hutcheson. The authors have investigated various methods of liberating chlorine by decomposing hydrochloric acid and chlorides with a weak electric current. The best results were obtained by moistening the goods with sea-water, and passing them between two slowly revolving carbon rollers, which were connected with opposite poles of the battery; sodium hypochlorite was formed in the fabric, and on immersion in acid the bleaching was effected. Results were also obtained with dilute hydrochloric acid. Pure hydrofluoric acid also bleaches when thus decomposed.

METEOROLOGICAL SOCIETY.

JUNE 21.—Mr. J. K. Laughton, President in the chair.—The following papers were read: "A New Metal Screen for Thermometers," by the Rev. F. W. Stow.—"On the Effect of different Kinds of Thermometer Cribs and of different Exposures in estimating the Diurnal Range of Temperature at the Royal Observatory, Cape of Good Hope," by Dr. D. Gill,—"Some Account of a Cyclone in the Mozambique Channel, January 14th-19th, 1880, by Mr. C. S. Hudson,—and "Rainfall of Frere Town, Mombassa, East Coast of Africa, 1875-1881," by Mr. R. H. Twigg.

SOCIETY OF CHEMICAL INDUSTRY.

At the last annual meeting, Professor H. E. Roscoe, LL.D., F.R.S., was appointed President; E. Rider Cook, Esq., East London Soap Works, Bow, E., Treasurer; and as Hon. General Secretary, George E. Davis, Dagmar Villa, Heaton Chapel, Stockport; Hon. Metropolitan Secretary, Thomas Tyrer, Garden Wharf, Battersea, London, S.W.; Hon. Northern Secretary, Eustace Carey, Widnes; also as Hon. Foreign Secretary, Ludwig Mond, Winnington Hall, Northwich. The Society of Chemical Industry was inaugurated upon April 4th last, and its formation has been received with very considerable interest, as evinced by the numerous inquiries respecting it, and also by the number of members already upon the register. Within three months from the inaugural meeting, there are nearly 350 names upon the register, comprising technical, analytical, and manufacturing chemists, assayers, professors and demonstrators in universities and colleges, alkali manufacturers, chemical engineers, mineral and chemical merchants, brewers, vinegar makers and sugar refiners, tar distillers, gas managers, dyers, calico-printers, tanners, soap and paper makers, oil refiners, glass and colour manufacturers, patent agents, and many others. This indicates that the Society is not intended to be representative of any particular industry, but of all those industries in which chemical science plays a part. Already upon the register are representatives of all the more important industries in this country. Prof. Hofmann and Dr. Martius, both of Berlin; Dr. Caro, of Mannheim; Professor Lunge, of Zurich; Professor Linde, of Wiesbaden; Herr Nobach, of Prague, have desired to become members, showing that the Society is appreciated abroad as well as at home. A resolution was passed at the inaugural meeting, admitting members (subject to the approval of the Council) upon their signing the admission form, which may be had from any of the Secretaries. Under this resolution, members are admitted for the space of six months upon payment of the annual subscription of one guinea for the year 1881, and without an entrance fee, whilst after that the annual subscription will be one guinea, with an entrance fee of two guineas. The first general meeting of the Society was held in the rooms of the Institution of Civil Engineers, Great George Street, Westminster, on Tuesday and Wednesday, the 28th and 29th of June, at which there was a good attendance of members representing the various branches of chemical industry. Upon the first day the President delivered an address, which will be printed and circulated in due course, and the Council reported upon the prospects of the Society. The following papers were then read:—"Recent Legislation on Noxious Gases," by E. K. Muspratt, Esq.; "The Brewing of Lager Beer," by Professor Chas. Graham; "On Mechanical Furnaces," by James Mactear, Esq. The next day was devoted to the reading and discussion of the following papers:—"The use of Coal Gas as a heating Agent," by Dr. C. W. Siemens, F.R.S., and "The Patent Laws as applied to Chemical Inventions," by Ludwig Mond, Esq.

PATENT IMPROVED DRY COLD-AIR REFRIGERATOR.

THE advent of hot weather has brought into notice the Dry Cold-Air Refrigerator of Gilbert's patent, the success of which is due to the atmospheric condition effected by means of a simple arrangement, a rod and sliding frames acting simultaneously with the opening and shutting of the outer door of the safe. The patent improved "dry cold air" is the only practical and scientific principle, not merely theoretical, and effects an enormous saving in ice. There is no condensation, no waste; everything remains dry, sweet, and cool, instead of being tainted by the vitiated atmosphere or decomposed by moisture, as is the case in other ice safes and refrigerators. The improved "dry cold air" consists in part of the use of sliding frames instead of valves, which were always liable to be injured when ice was placed in the chamber, and in addition to which an economy of space is also gained. Another feature of considerable importance is that of preventing the air passing through the outlet for waste water. Considering the inefficiency of the refrigerators in general use, this appears to be a step in the right direction.

Mr. Joseph Fournier, jun., of New York city, has patented an improved folding *carpet bed* that may be raised or tipped upon one of its edges, so as to stand in a vertical position against the wall when not in use. When in a horizontal position for use the bedstead is supported upon leaves hinged to the ends of the bedstead, and these leaves are adapted to be closed or folded in, like doors, against the bottom of the bedstead, so as to give the bedstead the appearance of a wardrobe or cabinet when tipped upon its edge.

THE CHANNEL TUNNEL.

(*Continued from Page* 80.)

I MAY, however, mention another example, the unfortunate contingencies which may arise, and which all intelligent Englishmen will admit—that catastrophes can happen in spite of every human attention and anticipation; for example, the sinking of ships having watertight compartments, because, at the moment of collision, the doors are accidentally left open, the crew lose their heads at the decisive moment, the safety apparatus is not ready, and cannot be used at the proper time. An event which happened in the war of 1870-71 will suffice to prove it. The French had mined the largest part of the tunnel through the Vosges, and all was ready for blowing up. They forgot to blow up the mines, and not a single tunnel was closed, and it was therefore possible for the Germans to gain a railway from the beginning which was so important to them for the good of their army. The strong barrier of the Vosges was broken.

To compare the tunnel with undertakings which, on the Continent, break through mountains and boundaries of states, is not in place just here. The inhabitants who by these means have been brought into nearer connection and relationship do not look at the mountain ridges that have been broken through as their rock of liberty and independence, but to the armies; for the future of the people is sealed, not on the mountains, but by great battles fought in the valleys. Herewith it is not said that the enemy is to have undisturbed use of the tunnel. Protective and defensive plans will find their places here; but with the loss of an egress of a tunnel the day of decision is only advanced, but is not given—quite as weak, and for the same reasons, is the reference to the daily increasing railway, road, and canal communication on the Continent.

Under certain circumstances, on account of the tunnel, all help from the fleet for defending the native shores can be made impossible; because, as soon as the enemy has taken possession of the tunnel, it is impossible for the most powerful British squadron to prevent the hostile army from flooding England and seizing the country, because the possession of the tunnel alone ensures to the French the connection with their base of operations. From that moment, in which such a tragic fate overtakes Old England, every help from the navy is paralysed, and tactical and strategical movements between two very unequal opponents would begin. But not only this first defensive line of England is broken through—the enemy has mastered also the second: he would be spared from forcing a landing after an unsuccessful sea-battle for the English.

This enemy would, without having vanquished the swimming walls and outworks, suddenly be in the interior of the fortress, and even be there where the whole life of England runs together to the one main artery—London.

When once French words of command are heard at the English entrance to the tunnel, England will be forced to accept any—even the hardest conditions—of peace. She will have to pay enormous contributions, deliver up the fleet, give up colonies, and, lastly, would have to give the tunnel as a mortgage to the fortunate enemy.

The English shore protected up to now by nature and the navy has made the nation too sure and peaceable; but this quietness, which has become almost immobility, this want of military activity, this carelessness in the duty of outposts, and other means of security, may lead to a loss of the battle. The Englishman is a man who thoroughly relies on experience, but just this cold thinking, this sober calculating life, according to which a man estimates his actions purely merchantlike, by profit and loss, supply and demand, this everyday and common-place life goes in glaring opposition with the quick, uninterrupted vicissitude of war, and that utmost mobility which is required there. This commercial trait of the English nation extends even to military affairs, and therefore obstructing every issue in this department, as Englishmen believe more and more in everlasting peace, and cannot comprehend that in our earnest century swords weigh more than gold.

[It must be here remarked that a great deal of all this should be taken *cum grano salis*. After settlement at London (if there the crisis be brought about), unless the whole Continent be against England, the men of the North, Lancashire, Yorkshire, &c., would have to be pacified. In short, in single combat, the old saying, that "to get in might be easy but to get out again more difficult," might be applied.]

I will now proceed to look at the opposite end of the tunnel, at Calais, and in which way I must meet the question which has to be answered—What wishes or fears France entertains towards this new connecting passage, which, I had almost said, draws England locally nearer to it? The answer is that France, being a great military power, will not have any objections from a military point of view against this new railway, but would like to see the tunnel completed as soon as possible, so as to be able to execute, at a suitable time, one squeeze more on the neighbouring island. The cry would be "*Possidentes beati.*" Even if, in the almost unimaginable case that the tunnel, with the exit at Calais, were, in a war between England and France, to fall into England's possession, France would have nothing to fear for its north-west departments, as it would only require one or the other Army Corps, with the support of the fortress, to prevent the enemy taking the offensive. One glance at the map will suffice, if we look at the Channel and its coasts, to show the superiority of France, as far as its naval and geographical development, as well as the fortified fortresses opposite to the English south and soulth-east coast. On the French coast one finds, even in the short line from the Belgian frontier to Cherbourg, three fortifications of the first rank—Dunkirk (*sous arrondissement maritime*), the encientes of which for years have been pushed forward: Calais, that just now is being strengthened by the building of detached forts; and Cherbourg, of which I will speak presently. After these come the fortifications of the second rank—Gravelines and Havre, the most important commercial port of France after Marseilles, as well as other smaller fortified places like Fecamp and Carentan. In all these more or less important places vessels can find shelter from wind and weather, and under the fortifications protection and shelter from pursuing men of war. I will not mention here the other unfortified ports and landing places situated on the above-mentioned limited coast, but must not forget to mention that immense place of refuge and port—Boulogne—although it can hardly be called a fortification, which is, from its geographical position, and the roomy extension of the port (the massively-built dams reach about a league into the sea), of the greatest importance.

First in rank is the strongest coast fortification of France Cherbourg (*arrondissement maritime, genie maritime, division des equipages de la flotte, construction navale, depots,* &c., &c.,)—the fortifications of which govern land and sea. In every direction Cherbourg inspires confidence and admiration; while at the same time the military eye rejoices at the solidity of the works and their excellent positions. One can hardly get over the surprise at the immense and secure docks which have been hewn out of the strongest rocks by really gigantic work. One must see these creations—they are not to be described. In planning out these grand sea establishments France had offensive naval undertakings in her mind. This should not be forgotten in England, and less so as each successive Government has ordered further building and consolidation. Tradition also plays a *rôle* in France (Boulogne). One can see there is no want of explosive war tinder here.

Behind these sea fortresses—especially those we have considered in the first line, the north-west—we find the fortifications of St. Omer, Lille, Arras, Douay, &c., which are nearly all connected by double lines of rails with one another, and with Calais.

And behind the above places we come at last to the centre, Paris, this giant fortification, with all the inexhaustible means of help for the living, as well as for the dead, which the present mode of conducting war renders necessary, and bound to the Channel by a network of railways.

But the present investigations are only brought into relief by considering the dislocation of the French troops in the north-west departments, whereby the fact is ascertained that on the line—Dunkirk-Cherbourg—the 1st, 2nd, 3rd and 10th French Army Corps are stationed, and in such a way that those portions of the corps which are garrisoned furthest from the coast can be despatched by rail in one day to the nearest port. The garrison of Paris could, after receiving commands, be sent in every direction. There can be no want for rolling stock here. In Dunkirk, Gravelines, Calais, Boulogne, Havre, and Cherbourg, an embarkation can take place any minute. Steamboats go from:—

Calais	to Dover in	1½	hours
Boulogne	to Dover in	2½	,,
Havre	to Dover in	12	,,
Cherbourg	to Dover in	14	,,

What has England got to show against the above-mentioned naval establishments, military arrangements, &c.? What preparations has she made to meet eventually hostile cupidity?

Protected by the Isle of Wight and the peninsula Gosport, &c., is the sea fortification of the first order, Portsmouth, England's pride. In this large and very secure port of war, the entrance of which is 1 km. broad, and which expands to 22 km., the whole English war fleet can anchor, as well as find protection and shelter against storms and waves.

Here are the largest English docks, immense dock-yards, &c.—in one word, everything that belongs to building, to repairing or provisioning of large men-of-war and merchant-men.

Opposite to Calais is Dover, 142 metres above the sea. The heights are well fortified and command the coast. The port is not very roomy, and has to battle against being filled with sand. On the right shore of the mouth of the Thames is Sheerness, with good dockyards and dry docks. Like Dover, this place can only be counted in the second rank. South-west from Sheerness lies Chatham, with its large naval arsenal, its dockyard, and its five large floating docks, &c. This place is at least secured against a *coup de main*.

A comparison between these points of support on the south east periphery of England—there are none in the second line behind—and the opposite armoured Channel coast ought, I should think, to give Englishmen enough to think about—ought to warn them against a too great state of happy-peacefulness and homage to the principle of universal fraternity, which may one day cost them dear, notwithstanding the good political relations that have existed between them and France for the last decades of years. Temporary community of interest between two nations can soon change into the opposite. Can they really, after the experiences of late French history, give way in England to a directly-fatal ingenuousness in judging French affairs, and an incredibly small knowledge of the real facts of the case—the endeavours and disposition of the neighbouring people, as well as the peculiar way of ever changing the leading personality? Do they not know in England the continual evolution of the public mind, and the continual shifting of the social political relations? Have they forgotten in England the many proofs of the French unsparing organ of destructiveness, that destroys in order to destroy, and only finds satisfaction in destruction? Have they forgotten the inconsiderateness, the thoughtlessness, and the foolhardiness that neither listens calmly to the consideration of the greatness of an existing error, nor to an approaching danger, and do they give no heed to that impatience which drives the French people forwards and outwards, I might almost say, without reflection, and suddenly breaks with its whole history?

The striving for absolute liberty and equality has made France through these most corrupted of all confused teachings the land of political experimental physics, keeps the Republic in a continual state of excitement, and endangers the peace of Europe, and that of England.

The military weakness of Great Britain certainly does not form a dåm on which the desire for action of mighty France will be scattered as dust, and the military ignorance of Great Britain will certainly not vanquish an energetic and prepared enemy.

Voices are already raised in the English press claiming for the coming international submarine road a declaration of neutrality; but, apart from the question that not all European nations will feel inclined to guarantee the maintenance of neutrality, such a request shows weakness, and is unworthy of a great Power. Moreover, history furnishes us with enough proofs of how often a resolute enemy cuts to pieces the parchment of such agreements, &c., with the sword, and put himself boldly beyond the ideas of international law. There are prizes which are too seducing for a nation—I do not say, to justify the breaking of a contract—as to make it defy the opinion of the world. Just as Louis XIV., on the 30th September, 1681, commanded in time of peace the seizure of Strasbourg; in 1700 the invasion of the Danes in Schleswig, and of the Russians into Livonia, gave provocation for the northern war; Napoleon, in 1798, on his way to Egypt, took possession, by surprise and treachery, of the island of Malta, and then—let the English listen to this—in 1807, without declaration of war, Copenhagen was bombarded, and the Danish fleet, as a consequence thereof, delivered over to the English.

When England really undertakes a thorough reform of its whole military forces, as on the Continent, where all institutions, &c., are centred in the army management—because the safety of the country depends on them, a military spirit permeates the whole people, as well as the army—then, and then only, there will be no military consideration to oppose the submarine railroad. But for that a few score years must elapse. Until then the tunnel might easily play the same part for England as the wooden horse did for Troy.

Every military man who has travelled in England, and can figure to himself the enormous passenger and goods traffic on the shores of the Channel, and on the Thames, will have little doubt that a *coup de main* on British ground might surrender the English entrance to the tunnel to the French, where the migration of nations takes place day and night without cessation, by steamers, sailing vessels, railroads, &c., where no control of the people can take place, nor is intended. But if anybody should still doubt, now that all sea affairs are altered, especially with regard to quickness and means of transport—that French troops could be landed—I would refer him to the successful landing of Napoleon in Egypt in 1805, in spite of the then great inferiority of the French fleet, and in spite of the English commanded by a Nelson, who was on the lurk.

As on the other side the management of the submarine railway will be attended to by French-English officials, it would be easy for the French railway officials to forward through the tunnel one or several trains with troops on the line St. Omer, Calais, without causing any sensation, after having cut the telegraph wires, and rendered the mines harmless. The union of the forces with others already landed, or landing, might easily lead to a successful result. But the tunnel once in French power, even if England still reigns on the sea, an endless transportation of troops would proceed, which would be hurried to Calais by rail from all parts of France, to emerge at Dover. Should England's fleet, which can hardly match in the Channel the united French fleet, receive a check, then all squadrons would be ordered to their country's shores (the Mediterranean, East Indian, West Indian, &c.), which might cause some complication (but this point I will pass over), and hostile troops having only to force a landing, but not to fight their way through the waves, England then would have to renounce its last chance. As the 35-km. long tunnel can be gone through by a train in one hour, Dover could be easily reached in twenty-four hours by just as many trains. For the first trains going, very likely both rails would be used, and later on the empty carriages would be sent back. If the English exit were made sure of, a large mass of troops could be concentrated on English ground, and in a shorter time than would be possible to be transported by railway, if they were sent through the tunnel in a nine hours' close-column, which, it is true, could only be done if a strong current of air were driven into the tunnel, so that man and beast might not be stifled on the road.

As soon as the French could collect Army Corps near Dover, and if one measures their system of war with the same measure as in 1870, where the movement *en avant* predominated, particularly at the beginning of a war, then one must expect that a French advanced guard would soon march to Chatham, which can be reached in four marches. But if a hostile cavalry division were on the spot, then the overflowing of English ground would be all the quicker and easier, as the enemy would find sufficient rolling stock at the large central station at Dover for the largest transport of troops, and by this means a quick movement forward would be easy, more particularly as nature has not placed one single imposing barrier between Dover and London, on which the troops and militia summoned to protect the capital could hope to call to the advancing enemy a decided "halt."

If, in spite of all warnings, the tunnel should be built, and should pay, then competition would soon cause another to be built, it would turn to good account the experiences of the first, and so, perhaps, build a big front entrance near the small back door.

That commerce and frivolity go hand in hand, and are oft even identical, makes this undertaking not the less dangerous.

Military science—this fearfully sober reality—must be treated with the utmost possible calmness of an experimental science; and one can call it what one will, only not military narrow-mindedness, which supports the rejection of the tunnel project against the demands of the spirit of the age. An opinion upon the strategical and tactical importance of the submarine road can only rest on military principles, and can only be given by military authorities, not by merchants.

For to-day let my last word be—

> "Only might founds states, and might
> only keeps them."

May England take it to heart.

A Blind Man's Vision.—One of the most eminent of living investigators into the phenomena of optics, is M. J. Plateau, of the Royal Academy of Belgium, who for the last 40 years has been so totally blind that he may direct his face to the sun without being sensible of the least objective clearness. His researches into the phenomena of light have excited the admiration of his fellow-scientists; his experiments, for example, on the wonderful colours of soap bubbles are exquisitely beautiful. M. Plateau has just published a little paper on the sensations which he experiences in his eyes, which is not only interesting but calculated to be of practical value. He states that he has constantly in his eyes the sensation of light; his field of division is divided into spaces, of which some are very clear, and others sombre or almost black. These spaces are not precisely limited, but run into each other at their borders; but what is remarkable is that their general tint alternates between grey and reddish. For example, if it be the grey M. Plateau perceives now, in a few hours it will be the red; then a few hours later, the grey again, and so on. The reddish tint is that obtained by mixing pale rose-colour or rather flesh-colour with a certain quantity of black. The relative arrangement of these different spaces is always the same but the intensity of their tint varies. The central space shows itself sometimes very clear, sometimes very sombre; above and below, as far as the limits of the visual field, there is sometimes clearness, sometimes obscurity. It is the same with the space to the left, there is generally a vertical, almost black band, and the space to the right of that, as far as its limit, is almost always clear and ruddy. These appearances seem to M. Plateau to fill the whole extent of his ordinary visual field. He believes the distance at which they are is small. These same appearances follow all the movements of the eyes, as if they resulted from a modification of the retinas. It appears to M. Plateau that the two eyes do not participate in the same manner in the tints in question; but he is absolutely incapable of distinguishing what belongs to the one from what belongs to the other. He has not been able to establish any coincidence between the changes of the general tint and the work of digestion. These observations have perhaps some interest from the physiological and medical point of view, and this is why M. Plateau has ventured to make them known. He attributes his blindness to the fact that, impelled by a senseless curiosity, he looked fixedly for a very long period at the sun in all its brightness, in order to observe the subsequent appearances in his eyes. It was only about 14 years later the chloroid was irrupted; but in that interval he often saw around lights, gas-flames, candles, &c., halos vividly coloured and persistent. If M. Plateau is not mistaken, Galileo, before his blindness, established the existence of similar halos; persons, then, M. Plateau argues, to whom such halos show themselves, would do well, if the phenomenon is repeated and becomes frequent, to consult an experienced oculist.

A Whip Attachment for horse powers has been patented by Mr. J. L. Crawford, of Pine Grove, Miss. This invention consists of a rod having a crank at one end and a whip at the other, the rod being attached to the lever to which the horses are attached, the rod being adapted to be moved longitudinally to bring the whip into position for whipping either horse.

PROPOSED MEDAL-MAKING REVIVAL.

Mr. Reginald Stuart Poole, says the *Artist*, has delivered a course of three lectures upon coins and medals at the Botanical Theatre of University College with a view to assisting Professor Legros in an attempt he is making to revive the medallist's art.

Mr. Poole said that for thirty years he had been as it were among the tombs. He had given his life to the study of what he felt to be a great art, and he had become the custodian of the collection which best exhibited its excellence. But he had believed that the art was dead. He had seen no sign of vitality in it, until one day he was encouraged to hope by seeing the medals which Professor Legros had executed of Mr. Tennyson, Mr. Gladstone, and Professor Darwin. He had gained further hope when he learned that the Slade professor, like a true artist, had formed a school for the practice of the art, which had already produced good work; and so he had come there to tell them what he could of a matter which he had so much at heart.

The lecture was illustrated with examples of Greek, Roman, and Renaissance medals, and was divided into two main sections: first, that in which the lecturer showed with much eloquence and feeling that the study was indeed great and valuable in the regard either of heart or of history; and second, that in which the student's attention was called to the special limitations and resources of the art as conditioned by the material employed, and the use for which it was designed.

This report, which is the subject of consideration by our contemporary the *Jeweller and Metalworker*, must be confined to the remarks of a practical nature which the lecturer offered.

Upon the obverse of a medal, except in rare instances, the lecturer observed, the head was represented. As to the treatment of the obverse, the Greeks and the Italians of the Renaissance represented entirely different schools. The Greek was idealistic: the Italian was scrupulously yet nobly realistic. The Roman artists occupied a middle position, and were not worthy a comparison with either. The familiar Greek head was, as it were, the head of heads: a noble ideal that embodied the quintessence of the real. It was a poor idealisation and a cowardly realism that resulted from an attempt to elevate an isolated individual into a type. That was the attempt of the Roman medallists. Their work wanted true beauty when compared with the Greek. It wanted the great quality of sincerity which gives undying value to the portrait medals of the Renaissance. There were thus three great schools. They might work in either of two: the third was the one to avoid.

The art of the medallist—the sculptor in relief—occupied a middle position between sculptor and painting, being subject partly to the conditions which govern the sculptor, partly to those subject to which the painter works. It was curious to observe accordingly that the medallist's art tended to the sculpturesque in the palmiest days of painting. The three-quarter face was the one which best fitted the field of the medal, the circle enclosed it more gracefully than it did the face in profile, and it was less stiff than the full face. But this was a position which presented extreme difficulties to the sculptor on account of the variety of different planes which the work presented; and it was noticeable that it was only for a short period, in the greatest days of Greek art, that the face was so presented. The lecturer begged them to avoid in their work any mathematical perfection. The medal should not be perfectly circular, but only so near to circular as it might be if drawn with the hand. So in like manner the field of the medal should not be a perfect plane. The Greeks had avoided this distressing precision always. They made very commonly the medal slightly convex on its obverse, and concave on its reverse. So the head seemed to grow out of and belong to its environment. It lived, as it were, in an atmosphere, and did not look so miserably lonely as in modern struck medals it does.

The lines of the design upon the medal were of necessity hand-drawn; and these could only seem properly in harmony with a hand-drawn bounding line. A circle described with a compass proclaimed in a distressing manner the conflict between science and art.

As to the design upon the reverse of the medal, it might be of various descriptions. It must, however, be simply composed, which was a condition dictated by the medium, and it must have some suitable subjective connection with its obverse. It should stand towards the obverse as the wife towards the husband. Complete in herself and beautiful to view: yet seeming more beautiful still, and attaining a higher perfection when the spiritual bond had been proclaimed and understood.

A SUBMARINE DETECTOR.

A new instrument, which promises to be of great value in searching for torpedoes, and in other submarine work, has been invented by Captain McEvoy, of No. 18, Adam Street, Adelphi, a gentleman well known in connection with torpedoes and submarine engineering. The detector has for its object the discovery of metallic bodies in the water, thereby facilitating their recovery when desired. The apparatus consists of a small mahogany box, in which there are a pair of coils or bobbins, a vibrator similar to that employed in electric bells for making and breaking contact, and a telephone. To the box is attached a given length of flexible cable with four conducting wires in it. At the other end of this cable is fixed a flat wooden case, in which there are two coils. There are also terminals on the box for attaching battery wires, and an arrangement for putting on and cutting off the current. There are two complete circuits through the box, cable, and wooden case: one primary and the other secondary. The battery vibrator—one coil in the box and one coil in the wooden case—are in the primary circuit. When the battery is on, the coils in the box are adjusted so that little or no noise from the make and break action of the vibrator is heard in the telephone. When so adjusted, the instrument is ready for work, and if the wooden case is then brought near a metallic body, a loud noise is heard in the telephone, thus indicating the proximity and locality of such body. The principle on which this invention is constructed is that of the induction balance of Professor Hughes. In this case the application of the principle to the uses referred to has been worked out in a very practical manner, and the apparatus, which we have seen in operation, cannot fail to be of importance in discovering and locating the position of torpedoes, submarine electric cables, lost anchors, chains, sunken vessels, treasures, &c., and in assisting the operations of divers.

OXFORD MILITARY COLLEGE.

At the last annual speech day of this institution, which prepares candidates for Woolwich, Sandhurst, Home and Indian Civil Service, Lord Waveney, in the absence of H.R.H. the Duke of Connaught, who wrote to express his regret at being unable to attend, gave away the prizes to the successful competitors for military proficiency.

Letters of regret were read from Lords Hertford and Jersey, Colonel Sir Robert Loyd Lindsay, Bishop Claughton, and many others.

His Lordship was seconded by General Burnaby, M.P., and Col. F. Duncan, R.A.

The proceedings were opened by an inspection of the students on parade. After the riding, sword, lance, and carbine exercises had been gone through, the reports from the Governor, General Desborough, on the military studies, and the Disciplinarian, Colonel Macartney, were read.

The sword of honour, given annually by Colonel Sir Robert Loyd Lindsay to the student passing highest from this college into Sandhurst or Woolwich, was awarded to Mr. Reade, and another sword, given by Lord Waveney for military proficiency, to Mr. Hibbert.

His Lordship then addressed the students at ome length, touching upon most of the important duties and requirements of a soldier. I am likewise glad, he said, to find that the head master of this college lays so much stress upon the study of modern languages, the importance of which cannot well be overrated now-a-days. He complimented the students upon the able manner in which the various military exercises had been performed.

The "Sun" Electric Lamp.—A new departure in electric lighting has just been made public by the introduction of the "Sun" electric lamp, in which the light is produced by the direct combination of the arc and incandescent systems in the same lamp. It is the invention of M. Louis Clerc, of Paris, and so far as a demonstration which was given recently showed, it certainly possessed special merits. The lamp consists of two carbon rods of D section, and about 6in. in length, the lower ends being inserted at an angle of about 40 degs. in a block of fire-clay or other refractory material, and the upper ends being electrically connected with the current generator. At the point in the fire-clay block where the lower ends of the two carbons approach each other a space is left in which is inserted a small block of white marble, upon which the carbons impinge. On the under side of this piece of marble is a small cavity having two perforations, by means of which the arc is first formed in the cavity. The marble quickly becoming heated, forms the light-giving centre, from which radiates a particularly soft and agreeable incandescent light. The carbons being of large sectional area, their consumption is very slow, and is followed up simply by their own gravitation. There is, in fact, no mechanism whatever about the lamp, which is of very simple construction, the fire-clay and marble blocks being merely held in a metal framing, which is suspended inside a glass globe. The carbons and the marble will last from 30 to 40 hours without either of them requiring renewal. The light produced is exceedingly steady, and is devoid alike of the blueness and the intensity of the arc light, and of the reddish yellowness of the incandescent lamp. At the demonstration alluded to, which was given in the vaults beneath the Royal Exchange, there were four lamps shown, two being in one room, one in a second room, and another in the engine-room. Each lamp was estimated to be of 1,400-candle power, and they were placed in glass globes of different kinds in order to judge of the effects of plain and opalescent glass. One of the lams was inverted, the light being thrown upwards upon a white ceiling, and by this means was well diffused throughout the whole apartment. The current was produced from a Gramme self-exciting machine, capable of working six lamps, and which was driven by a 12-horse-power Otto gas engine. The dynamo-machine was working in two circuits. On the whole, the light produced was very satisfactory, and, other things being equal, there would seem to be a promising future before this lamp, which is already in use in Paris and Brussels, and at the Royal Engineer's Barracks at Chatham.

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